

Service Manual

**CIRCUIT DESCRIPTIONS
REPAIR & ADJUSTMENTS**



**ORDER NO.
ARP-820-0**

FM/AM DIGITAL SYNTHESIZER TUNER

TX-960(BK) KU

TX-960L(BK) HE,HB

TX-960L HE,HB

MODELS TX-960, TX-960(BK), TX-960L AND TX-960L(BK) COME IN FIVE VERSIONS DISTINGUISHED AS, FOLLOWS:

Type	Applicable model				Power requirement	Destination
	TX-960 (BK)	TX-960	TX-960L (BK)	TX-960L		
KU	○	—	—	—	AC 120V only	U.S.A
KC	○	—	—	—	AC 120V only	Canada
HE	—	—	○	○	AC 220V, 240V (Switchable) *	European continent
HB	—	—	○	○	AC 220V, 240V (Switchable) *	United Kingdom
NEZ	○	○	—	—	AC 220V only	West Germany

* Change the primary wiring of the power transformer.

- This service manual is applicable to the TX-960(BK)/KU, TX-960L/HE, HB and TX-960L(BK)/HE, HB.
- As to the HE and HB, please refer to pages 27-36.
- As to the NEZ and KC types, please refer to the additional service manual (ARP-821)
- TX-960(BK) (TX-960L(BK)) is the same as the TX-960 (TX-960L) except for the exterior design (color).
- The AM tuner of the TX-960L (TX-960L(BK)) is a two wave-band tuner with MW (medium wave) and LW (long wave), but the TX-960 (TX-960(BK)) is MW only.
- TX-960(BK) is black version of TX-960 and TX-960L(BK) is black version of TX-960L, too.
- Ce manuel d'instruction se réfère au mode de réglage, en français.
- Este manual de servicio trata del método ajuste escrito en español.

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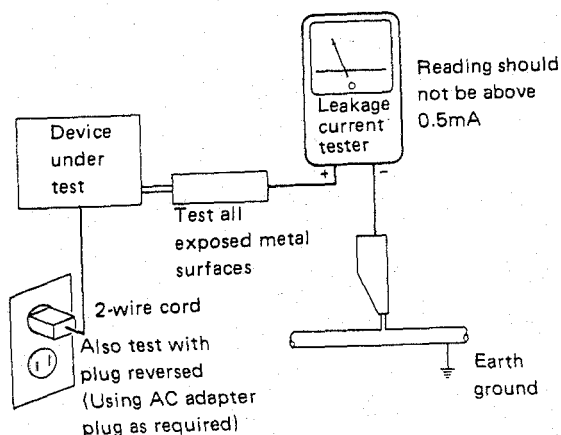
1. SAFETY INFORMATION

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technical.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a Δ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

2. SPECIFICATIONS

Model TX-960L

FM Tuner Section

Frequency range	87.5 MHz to 108 MHz
Usable Sensitivity	11.2 dBf, IHF (1 μ V/75 Ω)
Sensitivity (DIN)	Mono; 0.9 μ V/75 Ω Stereo; 31.5 μ V/75 Ω
Signal-to-Noise Ratio	Mono; 77 dB (at 85 dBf) Stereo; 73 dB (at 85 dBf)
Signal-to-Noise Ratio (DIN)	Mono; 66 dB Stereo; 60 dB
Distortion	Stereo; 0.4% (1 kHz)
Alternate Channel Selectivity	67 dB (400 kHz)
Stereo Separation	40 dB (1 kHz)
Frequency Response	30 Hz to 15 kHz \pm 1.0 dB
Antenna Input	300 Ω balanced 75 Ω unbalanced

MW Tuner Section

Frequency range 531kHz to 1,602 kHz
Sensitivity (IHF, Loop antenna) 300 μ V/m
Signal-to-Noise Ratio 50 dB
Antenna Loop Antenna

LW Tuner Section

Frequency range 153 kHz to 281 kHz
Antenna Loop Antenna

Audio Section

FM (100% MOD)	650 mV
MW/LW (30% MOD)	150 mV

Miscellaneous

Power Requirements
 HE model a.c. 220 Volts ~, 50/60 Hz
 HB model a.c. 240 Volts ~, 50/60 Hz
Power Consumption 10 W
Dimensions 420(W) x 60(H) x 215(D) mm
Weight (without package) 2.3 kg (5 lb 2 oz)

Furnished Parts

FM T-type Antenna	1
AM Loop Antenna	1
Connection Cord with Pin Plugs	1
Operating Instructions	1

NOTE:

Specifications and design subject to possible modification without notice due to improvements.

Model TX-960

FM Tuner Section

Frequency range	87.5 MHz to 108 MHz
Usable Sensitivity	11.2 dBf, IHF (1 μ V/75 Ω)
Signal-to-Noise Ratio	Mono; 77 dB (at 85 dBf) Stereo; 73 dB (at 85 dBf)
Distortion	Stereo; 0.4% (1 kHz)
Alternate Channel Selectivity	67 dB (400 kHz)
Stereo Separation	40 dB (1 kHz)
Frequency Response	30 Hz to 15 kHz \pm 1.0 dB
Antenna Input	300 Ω balanced 75 Ω unbalanced

AM Tuner Section

Frequency range 530 kHz to 1,600 kHz
Sensitivity (IHF, Loop antenna) 300 μ V/m
Signal-to-Noise Ratio 50 dB
Antenna Loop Antenna

Audio Section

Output Level	
FM (100% MOD)	650mV
AM (30% MOD)	150mV

Miscellaneous

Power Requirements
 KU and KC models AC 120 Volts, 60 Hz
Power Consumption 10 W
Dimensions 420(W) x 60(H) x 215(D) mm
 16-9/16(W) x 2-3/8(H) x 8-1/2(D) in
Weight (without package) 2.3 kg (5 lb 2 oz)

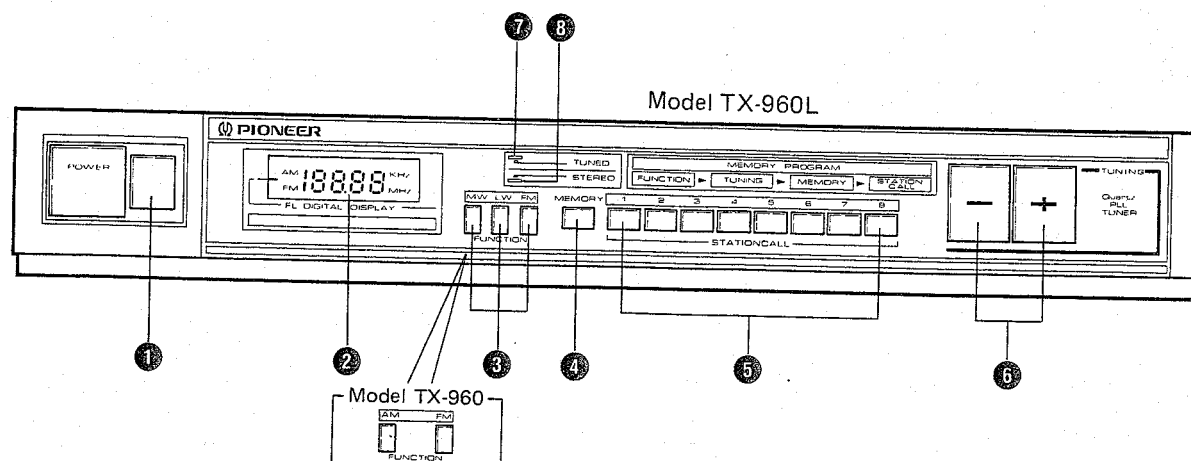
Furnished Parts

FM T-type Antenna	1
AM Loop Antenna	1
Connection Cord with Pin Plugs	1
Operating Instructions	1

NOTE:

Specifications and design subject to possible modification without notice due to improvements.

3. FRONT PANEL FACILITIES



1 POWER switch

When this switch is set to the on position, power is supplied to the tuner's main circuits. The unit's POWER switch is geared to selecting the transformer's secondary and so even at the stand-by position, the unit's circuitry will work as long as the power cord is connected to a power outlet. Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time.

2 FREQUENCY display

This shows the frequency of the station currently being received in digital form. The FM band is indicated by MHz, and the AM band by kHz.

3 FUNCTION switches

There are used to select either the FM, MW, LW broadcasting bands.

FM: Push to receive FM band broadcasts.

MW: Push to receive MW band broadcasts.

LW: Push to receive LW band broadcasts.

Only AM/FM switching is available for the TX-960 model.

4 MEMORY switch

Press to program stations. The memory circuit will operate for about 10 seconds after the switch is pressed, allowing stations to be programmed in the STATION CALL switches during this period. About 10 seconds after the MEMORY switch is pressed, the memory circuit ceases operating, and no stations can be programmed. In this case, press the MEMORY switch again.

5 STATION CALL switch

These are used to preset and recall broadcasting stations.

6 TUNING switch

These are used to locate the station. Push either of these two switches: the left switch "-" to go to a lower, and the right switch "+" to go to a higher frequency.

7 TUNED indicator

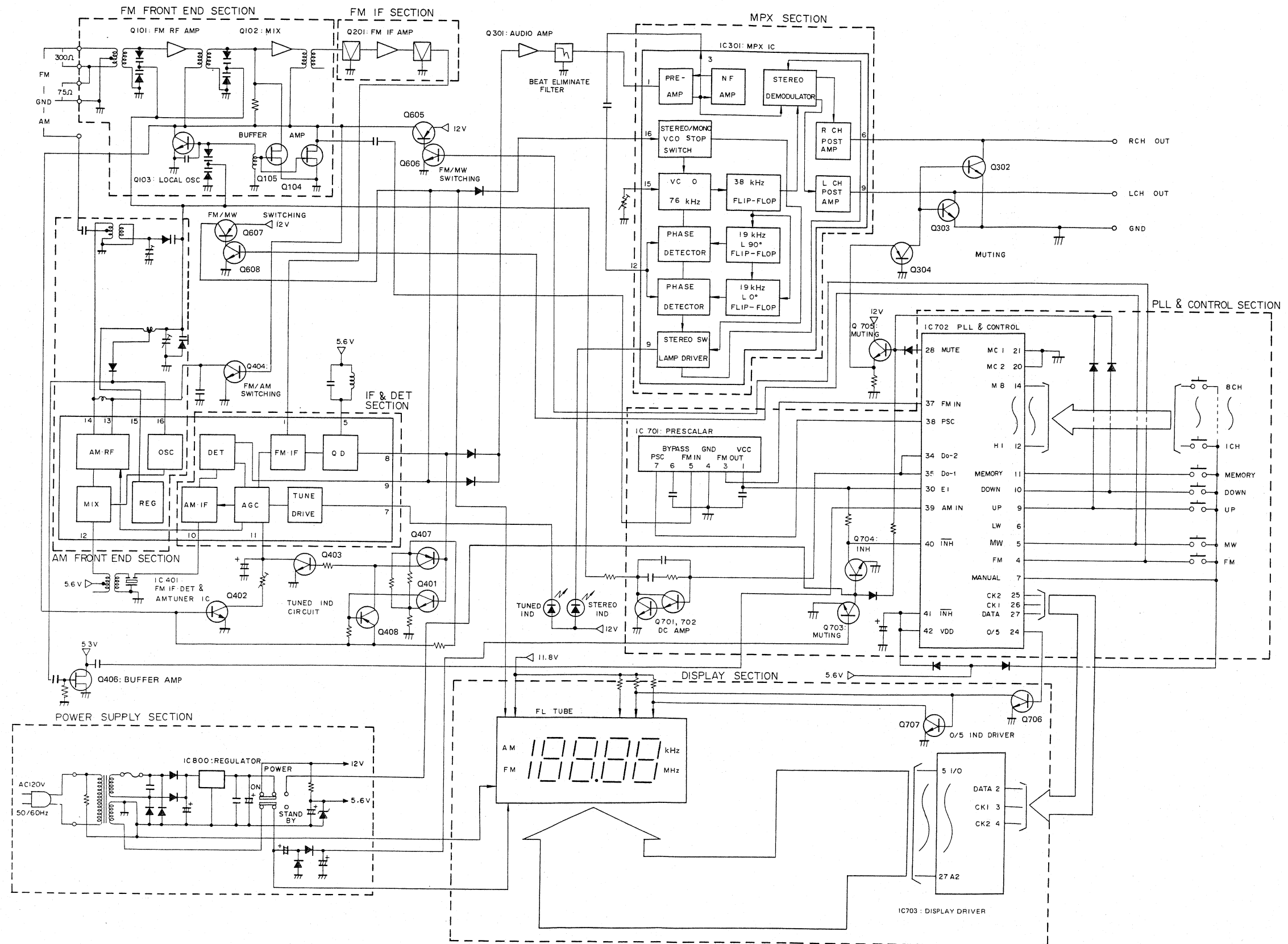
This lights up to indicate when finest tuning of a station has been achieved.

8 FM STEREO indicator

This lights when a stereo program has been picked up.

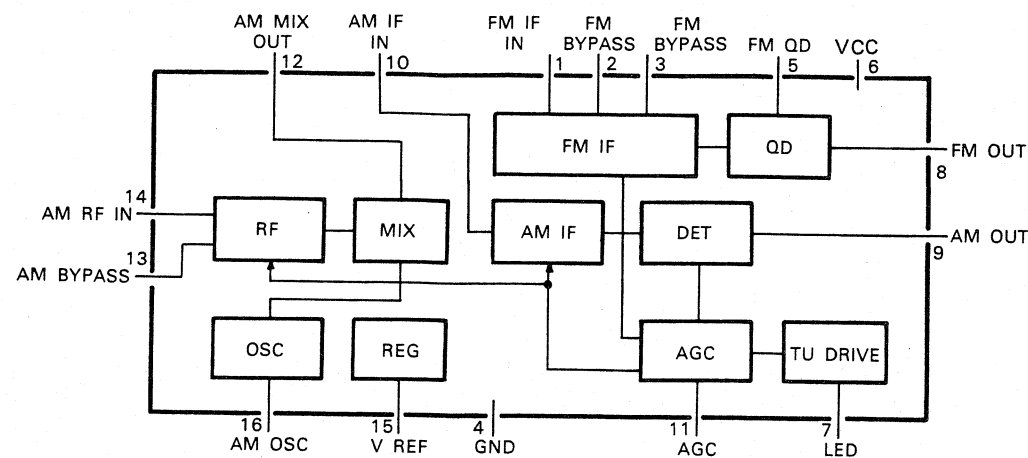
4. BLOK DIAGRAM

- For KU type



IC DATA

■ IC (LA1260) PIN DESCRIPTION

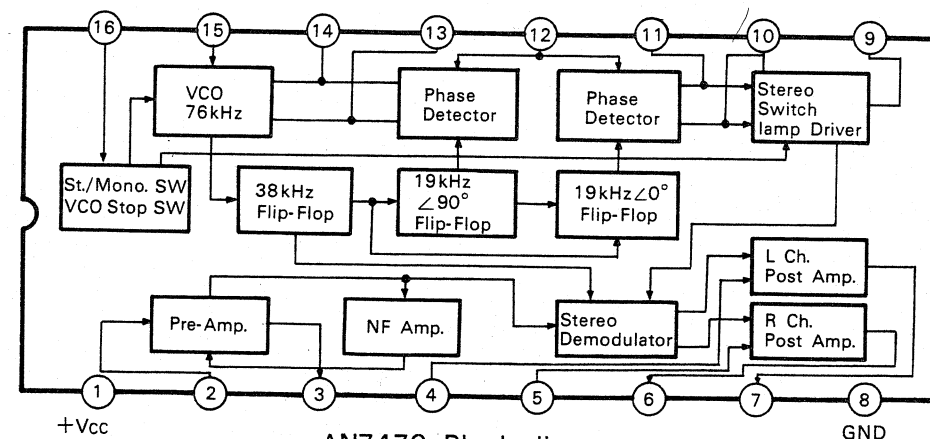


LA1260 Block diagram

Pin No.	Pin Name	Pin No.	Pin Name
1	FM-IF input	9	AM DET output
2	FM bypass capacitor connection	10	AM-IF input
3	FM DET coil connection	11 ^{*2}	AGC capacitor connection
4	GND	12 ^{*3}	AM mix output
5	FM DET output	13 ^{*4}	AM bypass capacitor connection
6	VCC	14	AM RF input
7 ^{*1}	LED drive terminal (TUNED)	15	Regulator output
8	FM DET output	16	AM OSC connection

- *1: Active low.
 *2: TUNED IND cannot be driven when the voltage of this pin becomes less than 0.9V. Accordingly, LED does not light up.
 *3: Pin ⑫ is turned to FM when it is opened. When the electric potential of pin ⑫ is made the same as pin ⑥ by direct current, the AM circuit is switched ON by the internal switch.
 *4: Pin ⑬ is turned to AM when it is opened. When pin ⑬ is grounded, the FM circuit is switched ON by the internal switch and AM circuit is switched OFF. At this time, pin ⑫ is connected in the same electric potential with pin ⑥.

■ IC (AN7470) PIN DESCRIPTION



AN7470 Block diagram

Pin No.	Pin Name	Pin No.	Pin Name
1	Vcc	9 ^{*1}	Stereo Indicator and VCO Freq. Monitor
2	Composite Sig. Input	10, 11	Pilot Det. Low-pass Filter
3	Buffer Amp. Output	12	Pilot Signal Input
4	L Ch. Amp. Feedback	13	PLL Low-pass Filter
5	R Ch. Amp. Feedback	14	PLL Low-pass Filter
6	R Ch. Amp. Output	15	VCO RC Time Const
7	L Ch. Amp. Output	16 ^{*2}	Forced Mono. VCO Killer
8	GND		

- *1: Active low.
 *2: VMO: ST-MONO switching voltage
 VVCO: VCO stop voltage
 ① STEREO-MONO automatic switching
 ② Compulsory MONO
 ③ VCO stop

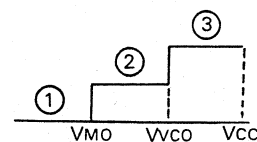


Fig. (a) Input applied to pin ⑩ of AN7470

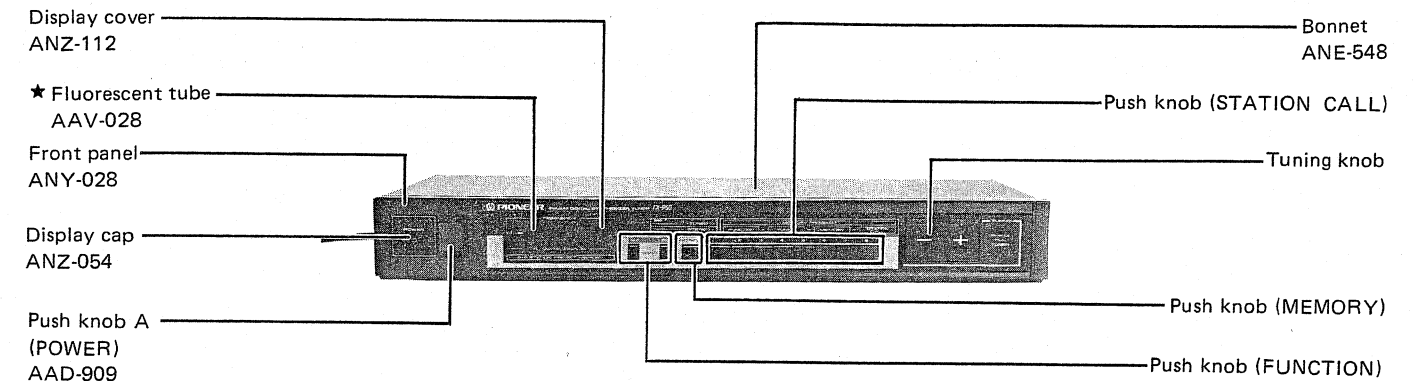
5. PARTS LOCATION

• For KU type

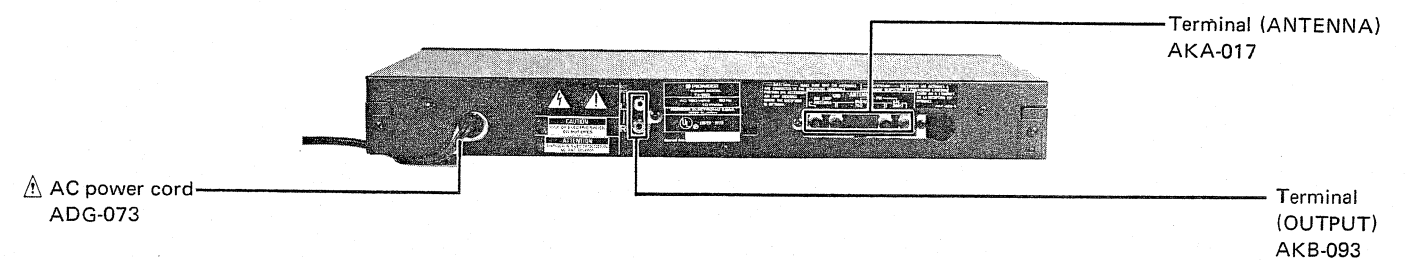
NOTES:

- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks $\star\star$ and \star .
 $\star\star$ GENERALLY MOVES FASTER THAN \star
 This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

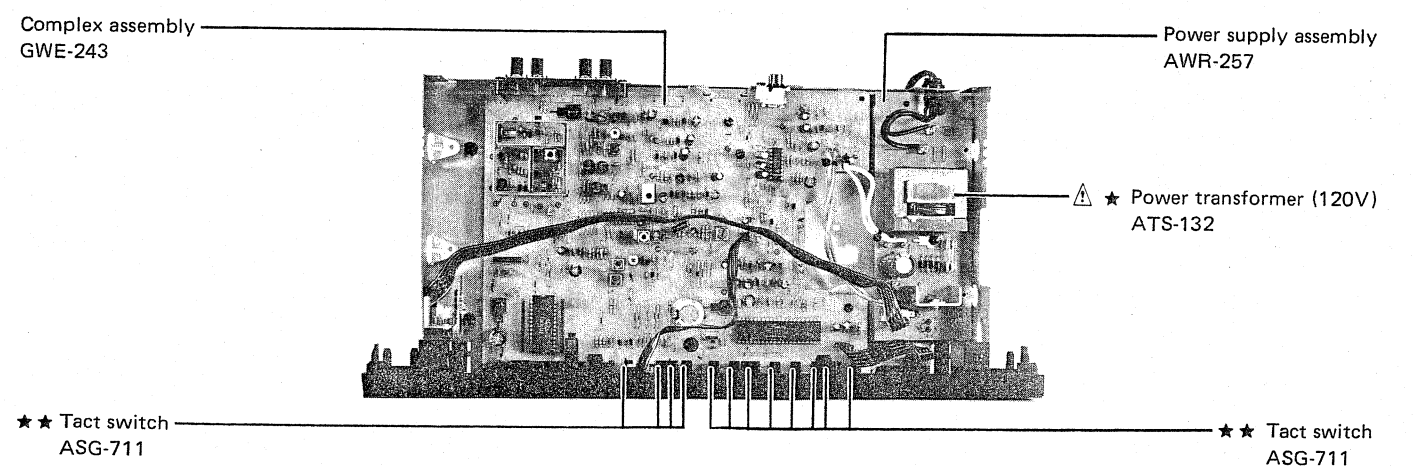
Front Panel View



Rear Panel View

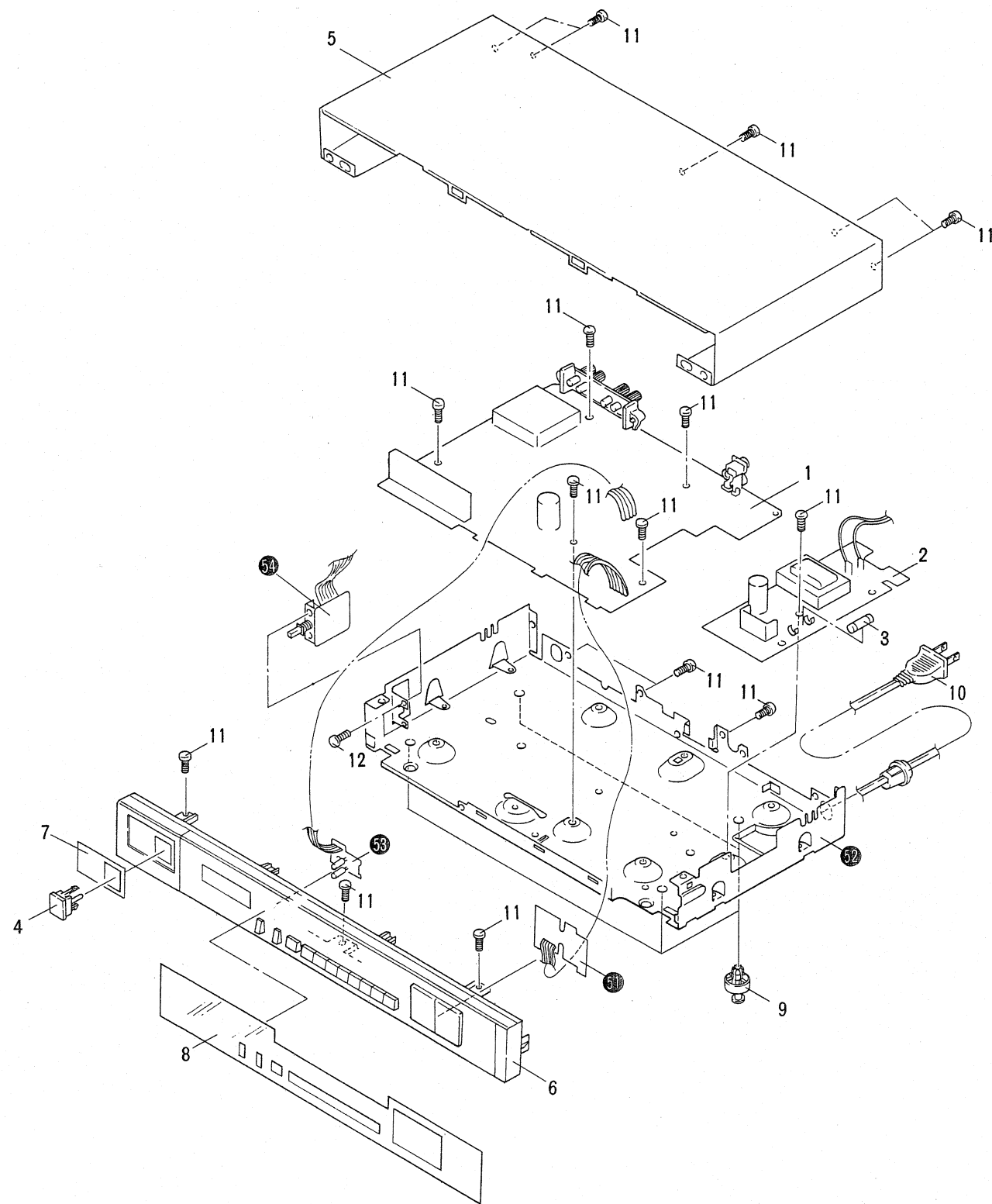


Top View



6. EXPLODED VIEW

• For KU type

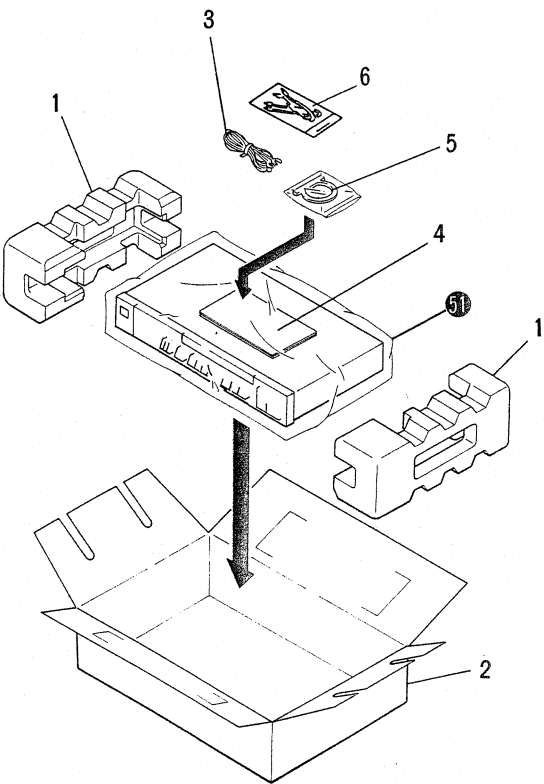


- NOTES:
- Parts without part number cannot be supplied.
 - The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
 - For your Parts Stock Control, the fast moving items are indicated with the marks $\Delta\Delta$ and Δ .
 - $\Delta\Delta$ GENERALLY MOVES FASTER THAN Δ
 - This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Parts List of Exploded View (TX-960(BK)/KU)

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1	GWE-243	Compley assembly		11	BBZ30P080FZK	Screw
	2	AWR-257	Power supply assembly		12	VMZ30P060FMC	Screw
$\Delta\Delta$	3	AEK-118	Fuse (125V/0.8A)		51		Switch assembly
	4	AAD-909	Push knob A (POWER)		52		Chassis
	5	ANE-548	Bonnet		53		LED assembly
	6	ANY-028	Front panel		54		Switch assembly (POWER)
	7	ANZ-054	Display cap				
	8	ANZ-112	Display cover				
	9	AEP-016	Leg assembly				
Δ	10	ADG-073	Power cord				

7. PACKING

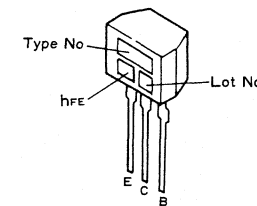


Parts List of Packing (TX-960(BK)/KU)

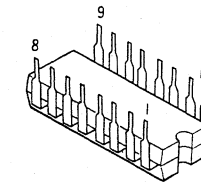
Mark	No.	Part No.	Description
	1	AHA-376	Side pad
	2	AHE-597	Packing case
	3	ADH-005	FM antenna
	4	ARB-684	Operating instructions (English)
	5	ATB-102	Loop antenna assembly
	6	ADE-074	Connection cord
	51		Sheet

External Appearance of Transistor and ICs

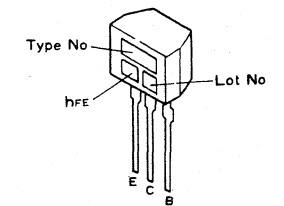
2SC2668
2SA933S
2SC1740S



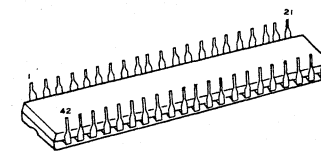
AN7470
LA1260



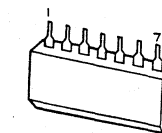
2SK161
2SK241



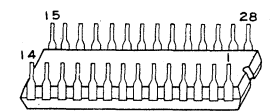
TC9157AP



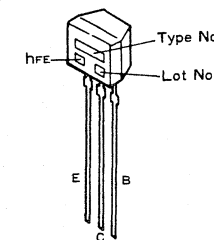
TD6104P



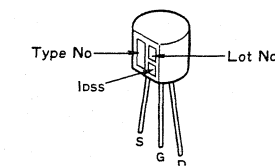
TD6301AP



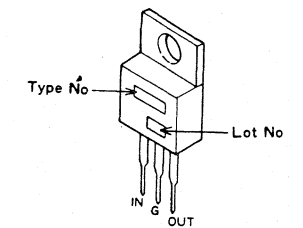
2SC2786



2SK246



μPC78M12H

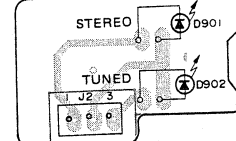


8. P.C.BOARDS CONNECTION DIAGRAM

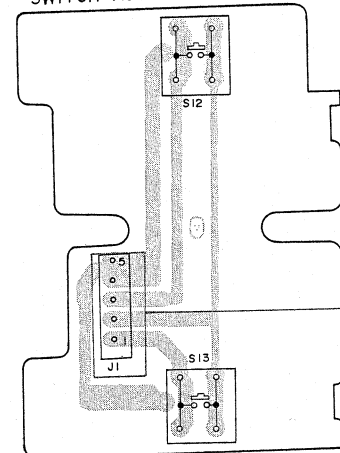
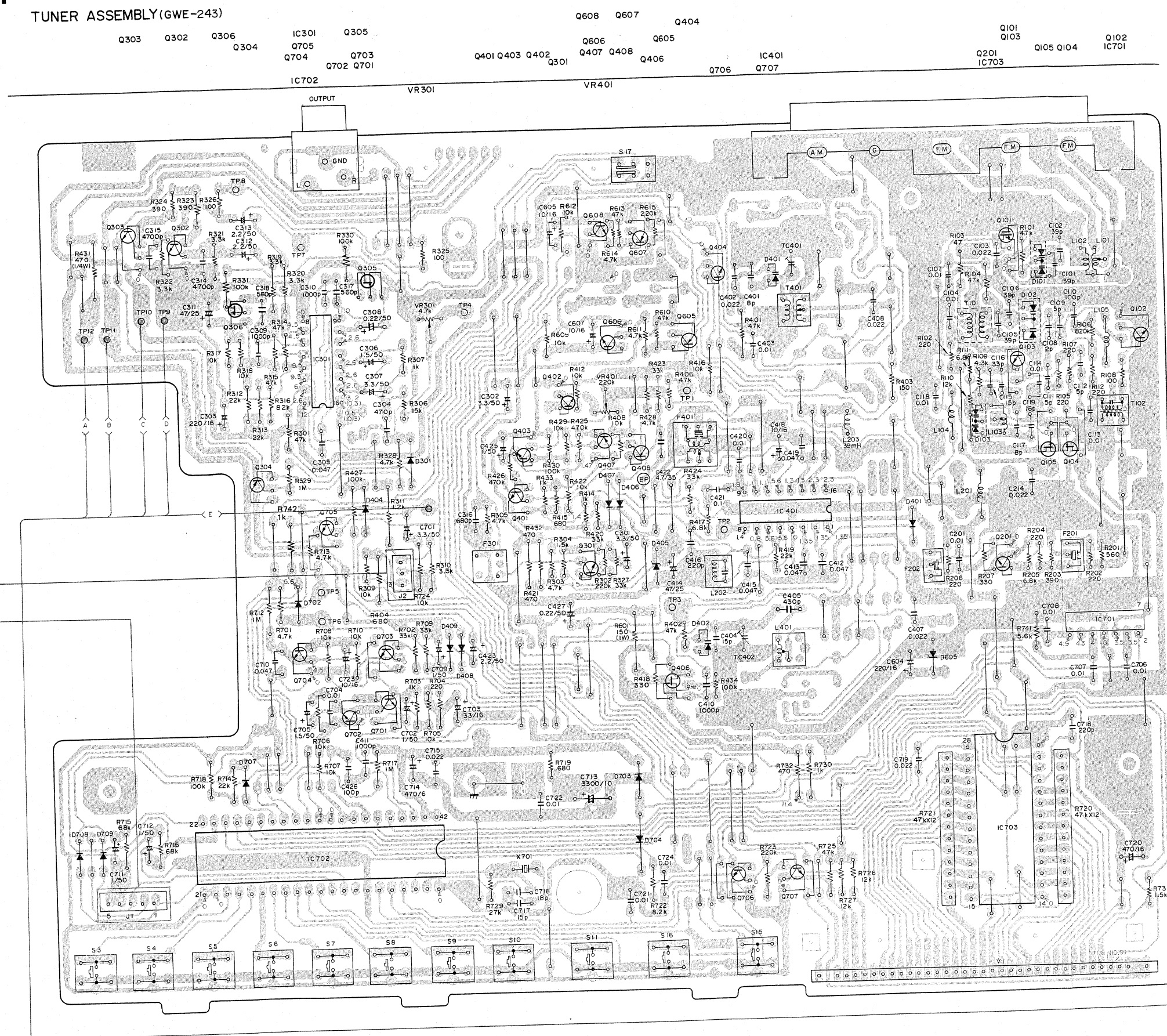
• For TX-960(BK)/KU model

TUNER ASSEMBLY(GWE-243)

LED ASSEMBLY

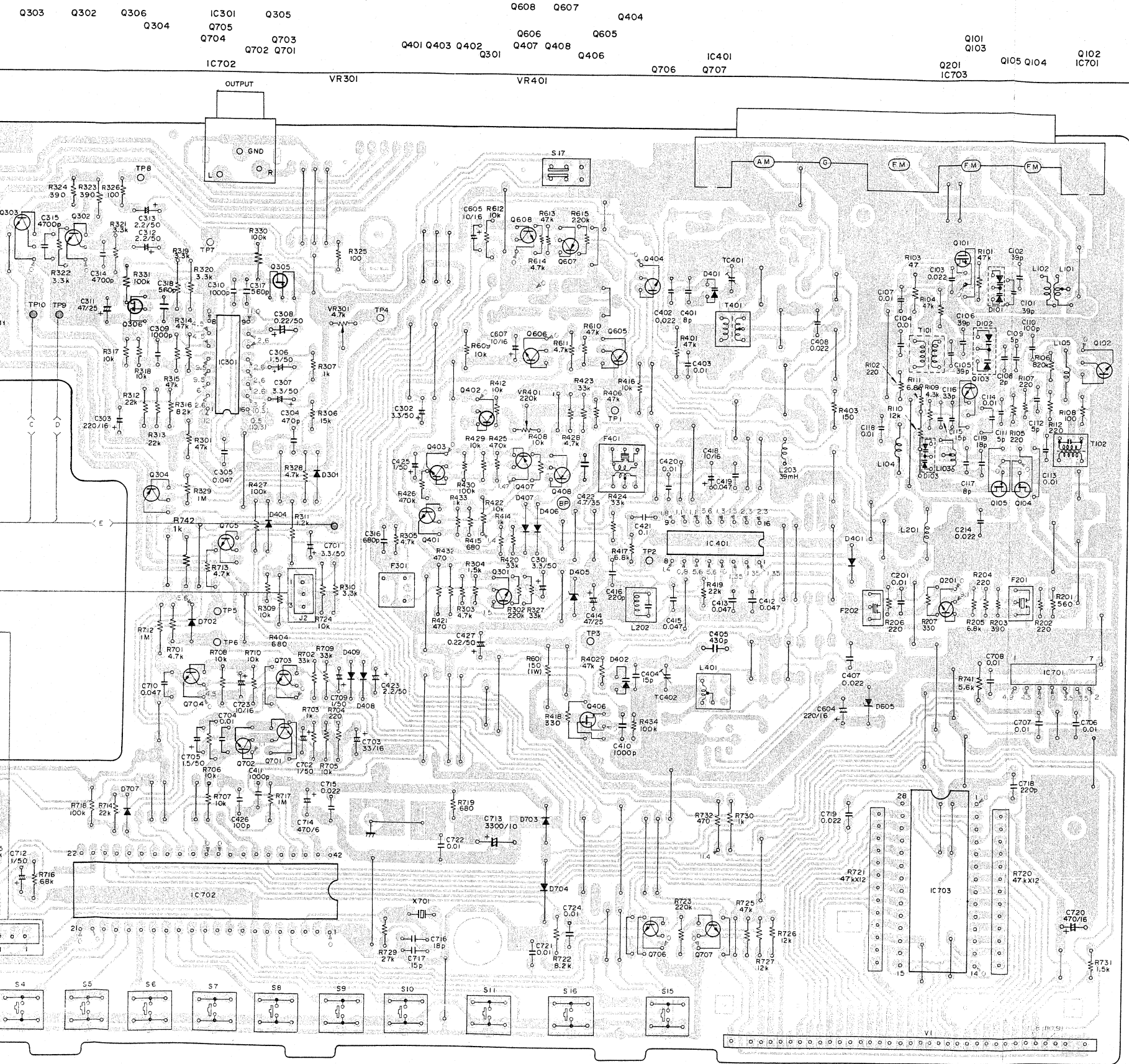
D901 AEL-382
D902 AEL-424

SWITCH ASSEMBLY

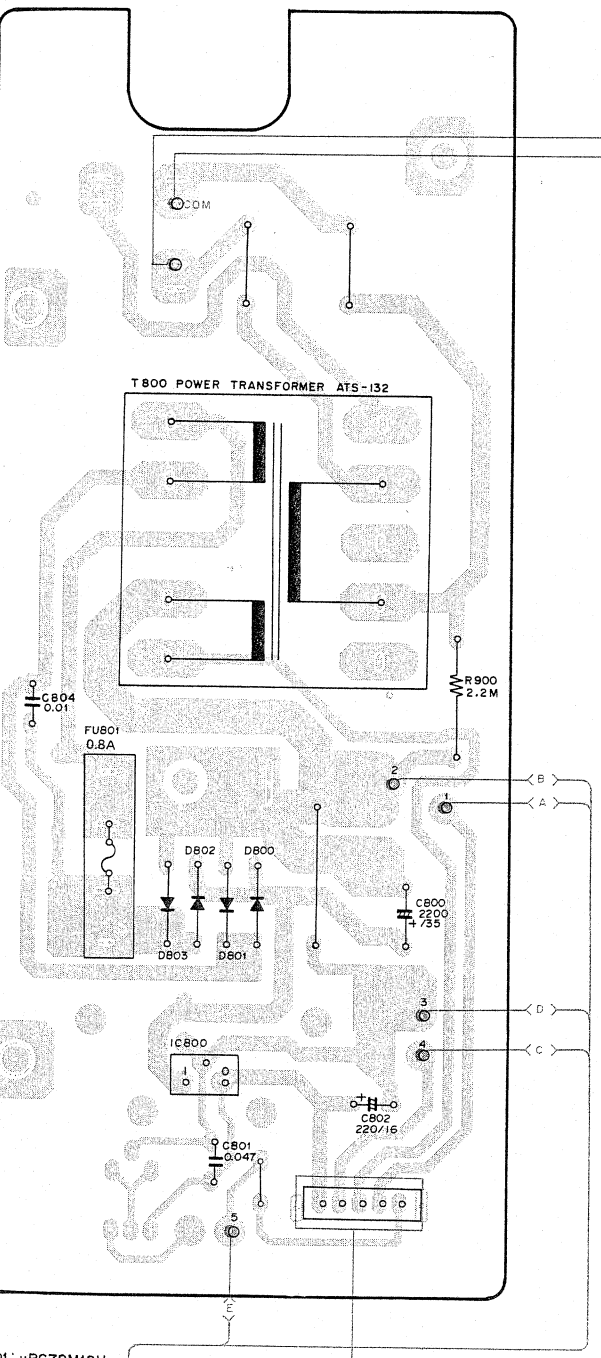
IC 301: AN 7470
IC 401: LA 1260
IC 701: TD6104P
IC 702: TC 9157AP
IC 703: TD 6301 APD101,102,103:
ISV 147
D301,404,406-410
702 704,707 709
ISI555
(US1035)
(ISSI31)Q101: 2SK241-Y
Q102: 2SC2786-LQ103,201:
2SC2668
Q104,105,406:
2SK161-Y
(2SK241-Y)Q 301,302,303
401-404,606,608
701-707:
2SC1740S
Q 304,407,408
605,607:
2SA933SD405,605:
RD5.6EB
(HZ5.6EB)
D401,402:
SVC321C2/D2

3 4 5 6 7 8 9

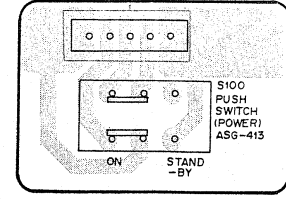
ASSEMBLY (GWE-243)



POWER SUPPLY ASSEMBLY (AWR-257)



IC801: μ PC78M12H
D801-804: S5566 (11E2)

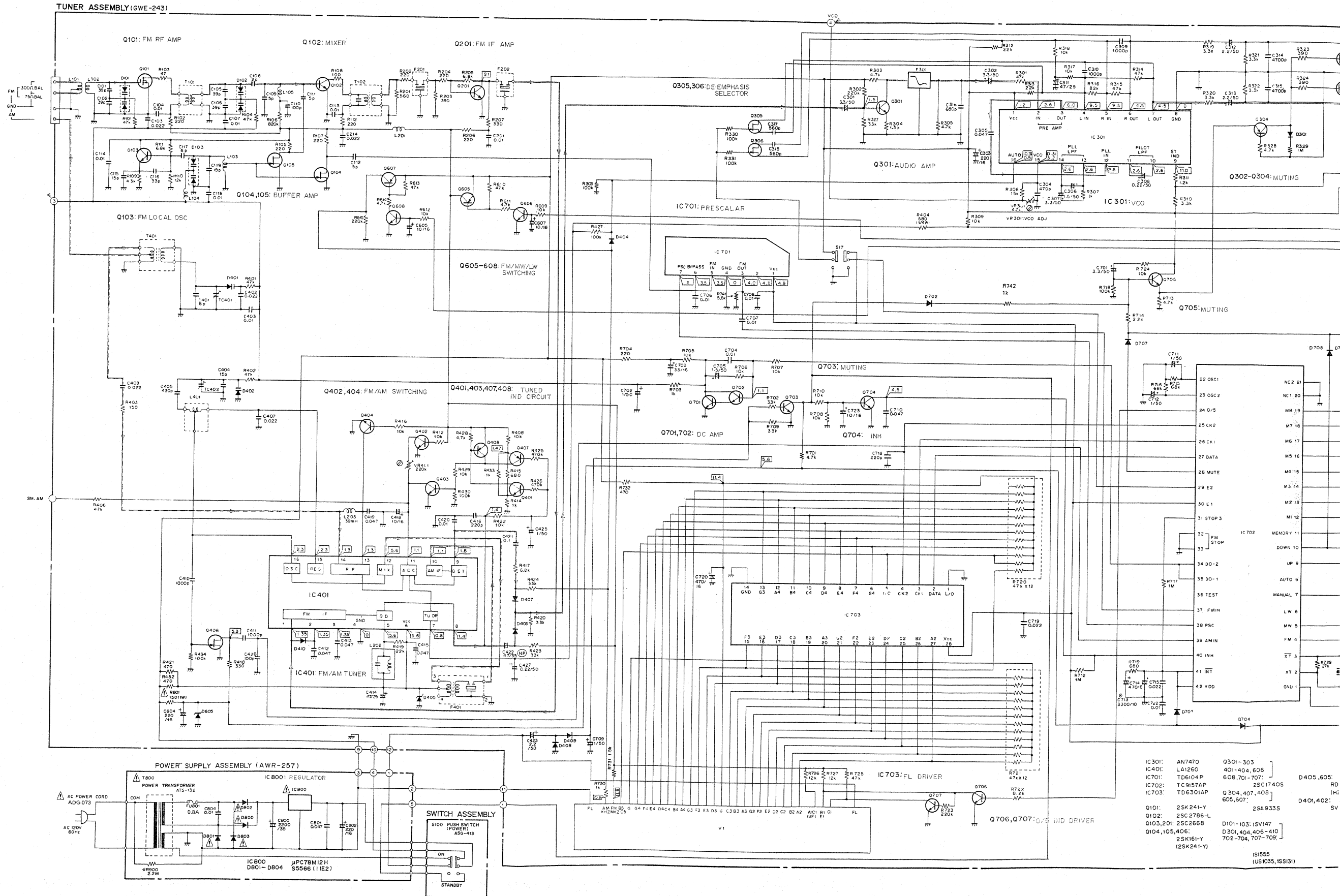


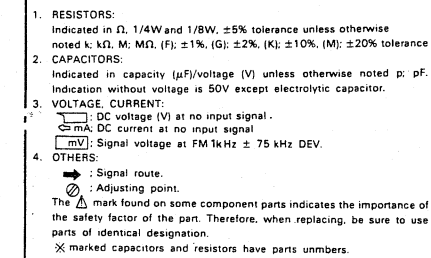
SWITCH ASSEMBLY

3 4 5 6 7 8 9

9. SCHEMATIC DIAGRAM

• For TX-960(BK)/KU model.





SWITCH ASSEMBLY

5	SWITCHES		
S3	STATION CALL 8	NORMAL	OFF
S4	STATION CALL 7	NORMAL	OFF
S5	STATION CALL 6	NORMAL	OFF
S6	STATION CALL 5	NORMAL	OFF
S7	STATION CALL 4	NORMAL	OFF
S8	STATION CALL 3	NORMAL	OFF
S9	STATION CALL 2	NORMAL	OFF
S10	STATION CALL 1	NORMAL	OFF
S11	MEMORY	NORMAL	OFF
S12	UP	NORMAL	OFF
S13	DOWN	NORMAL	OFF
S15	MW	NORMAL	OFF
S16	FM	NORMAL	OFF
S17	CHANNELSTEP	DE EMPHASIS 75us	50us
S100	POWER	AM STEP FREQUENCY ON-STANDBY	10KHz 9 KHz


THE UNDERLINED INDICATES THE SWITCH POSITION

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.


10. ELECTRICAL PARTS LIST

- For KU Type.

NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.
Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).
560Ω 56 × 10¹ 561..... RD4PS 561 J
47kΩ 47 × 10³ 473..... RD4PS 473 J
0.5Ω 0R5 RN2H 0R5 K
1Ω 010 RS1P 010 K
Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).
5.62kΩ 562 × 10¹ 5621 RN4SR 5621 F
The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.
★★ GENERALLY MOVES FASTER THAN ★
This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Miscellaneous

Mark	Symbol & Description	Part No.
	Tuner assembly	GWE-243
	Switch assembly	Non supply
	LED assembly	Non supply
	Power supply assembly	AWR-257
	Switch assembly (POWER)	Non supply
	AC power cord	ADG-073

Tuner Assembly (GWE-243)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC301	AN7470
★★	IC401	LA1260
★★	IC701	TD6104P
★★	IC702	TC9157AP
★★	IC703	TD6301AP
★★	Q304, Q407, Q408, Q605, Q607	2SA933S
★★	Q301 ~ Q303, Q401 ~ Q404, Q606, Q608, Q701 ~ Q707	2SC1740S
★★	Q103, Q201	2SC2668
★★	Q102	2SC2786-L
★★	Q104, Q105, Q406	2SK161-Y (23K241-Y)
★★	Q101	2SK241-Y
★★	Q305, Q306	2SK246
★	D405, D605	RD5.6EB (HZ5.6EB)
★	D401, D402	SVC321C2/D2
★	D101 ~ D103	1SV147
★	D301, D404, D406 ~ D410, D702 ~ D704, D707 ~ D709	1S1555 (US1035) (1SS131)

SWITCHES

Mark	Symbol & Description	Part No.
★★	S3 ~ S11, S15, S16 Tact switch	ASG-711 (ASG-703)
★★	S17 Slide switch (CHANNEL STEP)	ASH-034

COILS, FILTERS AND TRANSFORMERS


Mark	Symbol & Description	Part No.
	T401 AM antenna transformer	ATB-099
	T101 FM RF transformer	ATC-194
	T102 FM coupling transformer	ATE-063
	L401 AM OSC coil	ATB-100
	L101 FM antenna coil	ATC-192
	L102 FM antenna coil	ATC-193
	L103 FM OSC coil	ATC-214
	L202 FM DET coil	ATE-072
	L203 Inductor	ATH-116
	L104, L105, L201 Inductor	ATH-049
	F202 FM ceramic filter	ATF-107
	F201 FM ceramic filter	ATF-119
	F301 Beat eliminate filter	ATF-146
	F401 AM ceramic filter	ATF-133

CAPACITORS

Mark	Symbol & Description	Part No.
	C713 (3300μF/10V)	ACH-389
	TC401, TC402 Trimmer	ACM-015
	C716	CCCCH180J50 (CCDCH180J50)
	C416, C718	CCCSL221J50 (CCDSL221J50)
	C117, C401	CCDCH080D50
	C115, C404, C717	CCDCH150J50
	C116	CCDCH330J50
	C101, C102, C105, C106	CCDRH390J50
	C108	CCDSL020C50
	C109, C111, C112	CCDSL050C50
	C110, C426	CCDSL101J50
	C119	CCDTH180J50
	C422	CEANP4R7M35
	C308, C427	CEAR22M50L
	C425, C702, C709, C711, C712	CEA010M50L
	C306, C705	CEA1R5M50L
	C418, C723, C605, C607	CEA100M16L
	C312, C313, C423	CEA2R2M50L
	C303, C604	CEA221M16L
	C301, C302, C307, C701	CEA3R3M50L
	C703	CEA330M16L
	C311, C414	CEA470M25L
	C720	CEA471M16L
	C714	CEA471M6L
	C309, C310, C410, C411	CKCYB102K50 (CKDYB102K50)
	C314, C315	CKCYB472K50 (CKDYB472K50)
	C317, C318	CKCYB561K50 (CKDYB561K50)
	C316	CKCYB681K50 (CKDYB681K50)
	C305, C412, C413, C419, C710	CKCYF473Z50 (CKDYF473Z50)
	C415	CKCYX473M25 (CKDYX473M25)
	C104, C107, C113, C114, C118, C210, C403, C420, C704, C724, C706 ~ C708, C721, C722, C103, C214, C402, C407, C408, C715, C719	CKDYF103Z50
	C421	CQMA104J50
	C405	CQSA431J50
	C304	CQSA471J50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
★	VR401 Semi-fixed (220KΩ)	VRTB6VS224
★	VR301 Semi-fixed (4.7KΩ)	VRTB6VS472
	R601	RS1LMF151J
	R720, R721 Resistor array	RA12S473J
	R421, R432, R404	RD1/4PM□□□J
	Other resistors	RD1/8PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	Terminal (ANTENNA)	AKA-017
	Terminal (OUTPUT)	AKB-093
★	V1 FL tube	AAV-028
★	X701 Crystal reserator	ASS-025

Switch Assembly

SWITCHES

Mark	Symbol & Description	Part No.
★★	S12, S13	ASG-711 (ASG-703)



LED Assembly

SEMICONDUCTORS


Mark	Symbol & Description	Part No.
★	D901	AEL-382
★	D902	AEL-424

Power Supply Assembly (AWR-257)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
 ★★	IC800	μPC78M12H
 ★	D800 ~ D803	S5566 (11E2)

TRANSFORMER

Mark	Symbol & Description	Part No.
 ★	T800 Power transformer (120V)	ATS-132

CAPACITORS

Mark	Symbol & Description	Part No.
	C800	CEAS222M35
	C802	CEA221M16L
	C801	CKDYF473Z50
	C804	CKDYF103Z50

RESISTOR

Mark	Symbol & Description	Part No.
	R900 (2.2MΩ)	ACN-209

OTHER

Mark	Symbol & Description	Part No.
	Screw	PBZ30P060FMC

Switch Assembly (POWER)

Mark	Symbol & Description	Part No.
	▲ ★ ★ S100 Push switch (POWER)	ASG-413

11. ADJUSTMENTS

FM Tuner Section Adjustment

- Connect up as indicated in Fig. 11-1.
- Press the FM key to set FM mode.

Note: Stereo modulation: Main 1 kHz L+R±68.25 Hz dev.
Pilot 19 kHz±6.75 kHz dev.

Step No.	FM SG (1 kHz ± 75 kHz dev.)		TX-960 tuned (TX-960L) frequency display	Adjustment	
	Frequency(MHz)	Level (dB)		Adjustment location	Specifications
1	No input signal		87.5 MHz	—	Check pin 3 (3.4V±1.5V) of tuner assembly.
2			108.0 MHz	—	Check pin 3 (8.7V ^{+2.5V} _{-2.0}) of tuner assembly.
3	98.0	20—30	98.0 MHz	T101, T102	Set the output from pin 1 of the tuner assembly to maximum level. (Before performing the adjustment of Step 3, turn VR401 fully counterclockwise.)
4	98.0	60	98.0 MHz	L202	Set pin 2 of tuner assembly to 1.4V (±0.01V)
5	98.0	80	98.0 MHz	VR401	Set pin 1 of tuner assembly to 1.1V (±0.01V).
		0		—	Check pin 1 of tuner assembly below 0.8V.
6	98.0	80	98.0 MHz	VR301	Adjust the frequency at pin 4 of tuner assembly to 76kHz (±150 Hz).
No modulation					
7	98.0	60	98.0 MHz	T102	Minimize distortion in both left and right channel outputs (adjust T102 to within ± 90°).
Stereo modulation (note)					
8	98.0	Variable	98.0 MHz	Confirm that the TUNED IND and STEREO IND light up when the level of FM SG is turned to high, and that the TUNED IND and STEREO IND light off when the level of the FM SG is turned to low.	
Stereo modulation (note)					

AM (MW) Tuner Section Adjustment

- Connect up as indicated in Fig. 11-2.
- Press the AM (MW) key to set AM (MW) mode.
- Set the AM CHANNEL STEP switch to the 9 kHz position. (TX-960/KU only)

Step No.	AM SG (400 Hz, 30% modulation)		TX-960 tuned (TX-960L) frequency display	Adjustment	
	Frequency (kHz)	Level (dB)		Adjustment location	Specifications
1	No input signal		531 kHz	L401	Set pin 3 of tuner assembly to 1.3V ($\pm 0.1V$).
2			1602 kHz	TC402	Set pin 3 of tuner assembly to 10.0V ($\pm 0.3V$).
3	Repeat steps 1 and 2 until both specification ratings are satisfied.				
4	603	40	603 kHz	T401	Set the output from pin 1 of the tuner assembly to maximum level.
5	1395	40	1395 kHz	TC401	
6	Repeat steps 4 and 5 until both specification ratings are satisfied.				
7	1395	Variable	1395 kHz	Check that the TUNING indicator comes on when the AM SG level is gradually increased.	

AM (LW) Tuner Section Adjustment (TX-960L only)

- Connect up as indicated in Fig. 11-2.
- Press the AM (LW) key to set AM (LW) mode.

Step No.	AM SG (400 Hz, 30% modulation)		TX-960L tuned frequency display	Adjustment	
	Frequency(kHz)	Level (dB)		Adjustment location	Specifications
1	No input signal		281 kHz	L503	Set pin 3 of tuner assembly to 5.2V ($\pm 0.1V$).
2	164	40	164 kHz	T501	Set the output from pin 1 of the tuner assembly to maximum level.
3	254	40	254 kHz	TC501	
4	Repeat steps 2 and 3 until both specification ratings are satisfied.				

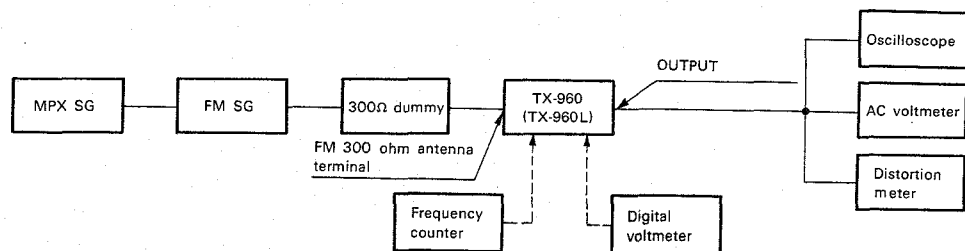


Fig. 11-1. FM adjustment connection diagram

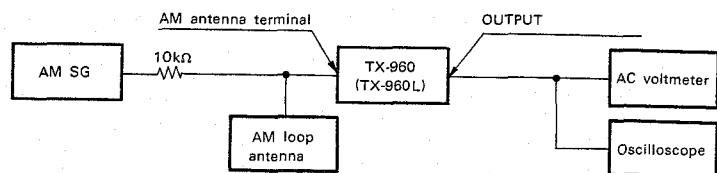


Fig. 11-2. AM adjustments connection diagram

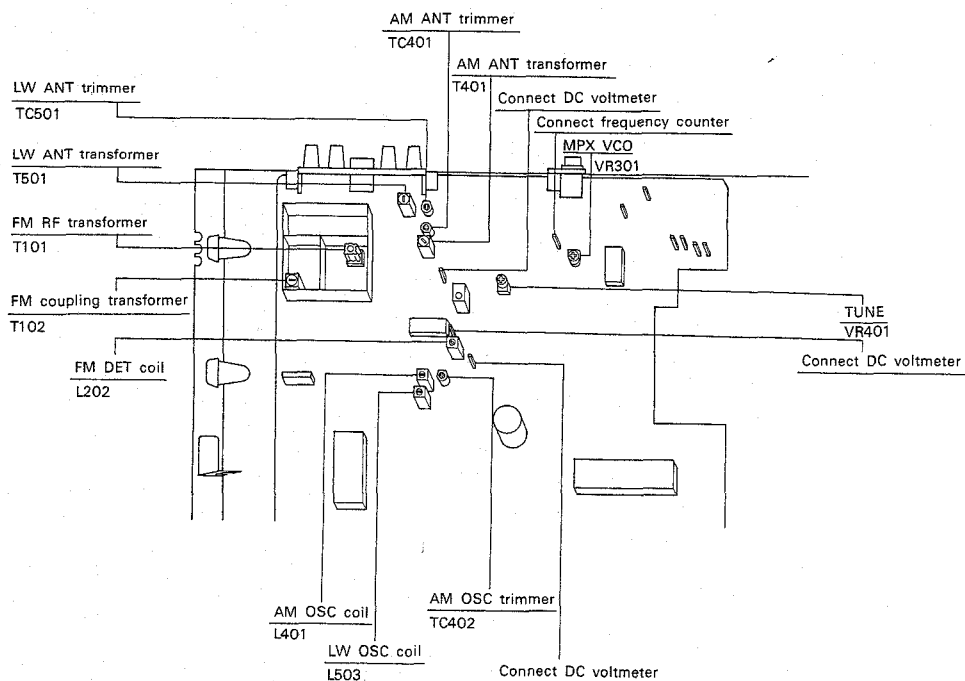


Fig. 11-3. Adjustment positions

11. RÉGLAGE

Réglage de la partie syntoniseur MF

- Faire les raccordements comme indiqué en Fig. 11-1. Note: Modulation stéréo: Principal 1kHz L+R \pm 68,25kHz dév. Pilote 19kHz \pm 6,75kHz dév.
- Enfoncer la touche MF pour régler en mode MF.

Etape N°	FM SG (1kHz, \pm 75kHz dév.)		Affichage de fréquence syntonisée TX-960 (TX-960L)	Réglage	
	Fréquence (MHz)	Niveau (dB)		Lieu de réglage	Caractéristiques
1	Pas de signal d'entrée		87,5 MHz	—	Vérifier la fiche 3 (3,4V \pm 1,5V) de l'ensemble syntoniseur.
2			108,0 MHz	—	Vérifier la fiche 3 (8,7V \pm 2,5V) de l'ensemble syntoniseur.
3	98,0	20 à 30	98,0 MHz	T101, T102	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal. (Avant d'effectuer le réglage de l'Etape 3, tourner VR401 à fond dans le sens horaire inversé.)
4	98,0	60	98,0 MHz	L202	Régler la fiche 2 de l'ensemble syntoniseur à 1,4V (\pm 0,01V).
5	98,0	80	98,0 MHz	VR401	Régler la fiche 1 de l'ensemble syntoniseur à 1,1V (\pm 0,01V).
		0		—	Vérifier si la fiche 1 de l'ensemble syntoniseur est endessous de 0,8V.
6	98,0	80	98,0 MHz	VR301	Régler la fréquence de la fiche 4 de l'ensemble syntoniseur à 76 kHz (\pm 150Hz).
7	98,0	60	98,0 MHz	T102	Réduire la distorsion dans les sorties des deux canaux droit et gauche (régler T102 à \pm 90°).
8	98,0	Variable	98,0 MHz	Confirmer que le TUNED IND et le STEREO IND s'allument lorsque le niveau de FM SG est syntonisé trop haut, et que le TUNED IND et STEREO IND sont éteints lorsque le niveau de FM SG est syntonisé trop bas.	

Réglage de la partie syntoniseur MA (MW)

- Faire les raccordements comme indiqué en Fig. 11-2.
- Enfoncer la touche MA (MW) pour régler en mode MA (MW).
- Régler le commutateur MA CHANNEL STEP en 9ème position. (TX-960/KU uniquement)

Etape N°	AM SG (400Hz, 30% modulation)		Affichage de fréquence syntonisée TX-960 (TX-960L)	Réglage	
	Fréquence (kHz)	Niveau (dB)		Lieu de réglage	Caractéristiques
1	Pas de signal d'entrée		531 kHz	L401	Régler la fiche 3 de l'ensemble syntoniseur à 1,3V (\pm 0,1V).
2			1602 kHz	TC402	Régler la fiche 3 de l'ensemble syntoniseur à 10,0V (\pm 0,3V).
3	Répéter les Etapes 1 et 2 jusqu'à ce que les taux nominaux préconisés soient atteints.				
4	603	40	603 kHz	T401	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal.
5	1395	40	1395 kHz	TC401	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal.
6	Répéter les Etapes 4 et 5 jusqu'à ce que les taux nominaux préconisés soient atteints.				
7	1395	Variable	1395 kHz	Vérifier si l'indicateur TUNING s'allume lorsque le niveau de AM SG augmente graduellement.	

Réglage de la partie syntoniseur MA (LW) (TX-960L uniquement)

- Faire les raccordements comme indiqué en Fig. 11-2.
- Enfoncer la touche MA (LW) pour régler en mode MA (LW).

Etape N°	AM SG (400Hz, 30% modulation)		Affichage de fréquence syntonisée TX-960L	Réglage	
	Fréquence (kHz)	Niveau (dB)		Lieu de réglage	Caractéristiques
1	Pas de signal d'entrée		281 kHz	L503	Régler la fiche 3 de l'ensemble syntoniseur à 5,2V (\pm 0,1V).
2	164	40	164 kHz	T501	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal.
3	254	40	254 kHz	TC501	
4	Répéter les Etapes 2 et 3 jusqu'à ce que les taux nominaux préconisés soient atteints.				

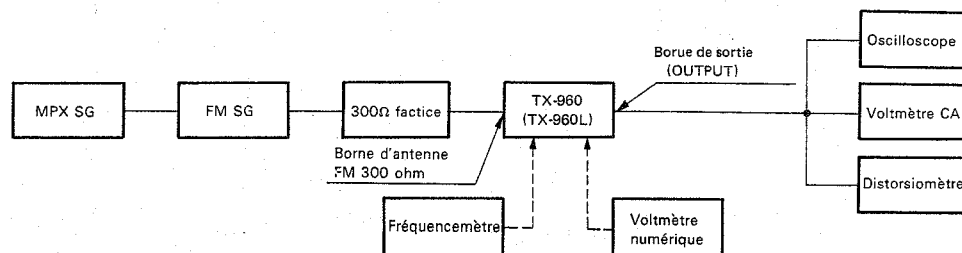


Fig. 11-1 Diagramme de raccordement de réglage MF

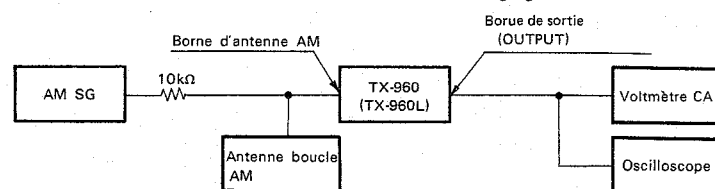


Fig. 11-2 Diagramme de raccordement de réglage MA

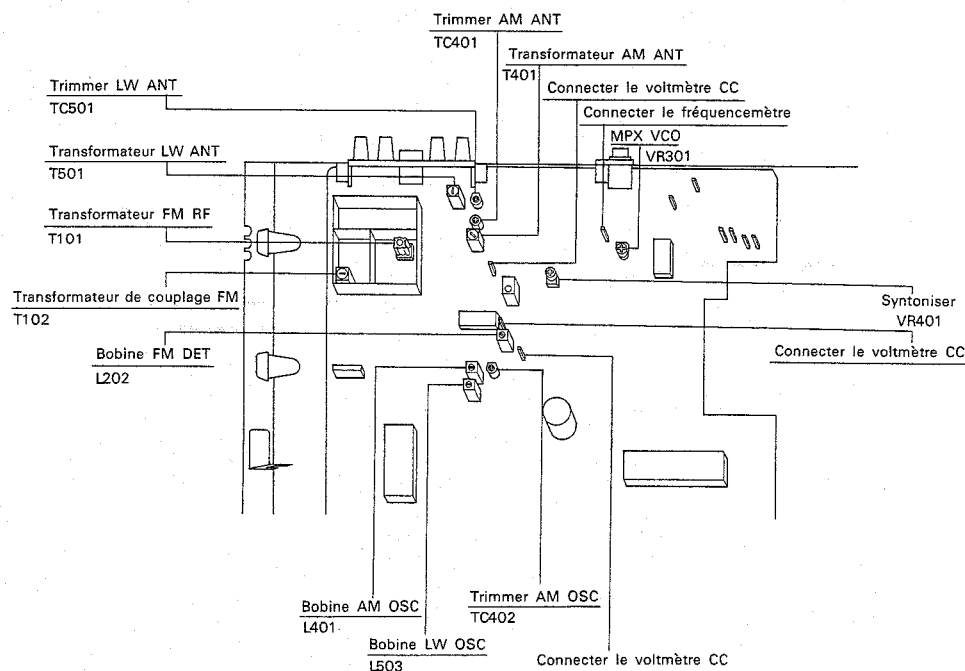


Fig. 11-3 Positions de réglage

11. AJUSTE

Ajuste de la sección del sintonizador de FM

- Conecte como es indicado en la Fig. 11-1.
- Oprima la tecla de FM para fijar el modo de FM.

Nota: Modulación estero: Principal 1 kHz L+R \pm 68,25 kHz dev.
Piloto 19kHz \pm 6,75 kHz dev.

No. de paso	FM SG (1 kHz, \pm 75 kHz dev.)		Visualización de frecuencia sintonizada TX-960 (TX-960L)	Ajuste	
	Frecuencia (MHz)	Nivel (dB)		Lugar de ajuste	Especificaciones
1	No hay señal de entrada		87,5 MHz	—	Inspeccione la patilla 3 del conjunto del sintonizador ($3,4 \pm 1,5V$).
2			108,0 MHz	—	Inspeccione la patilla 3 del conjunto del sintonizador ($8,7V^{+2,5V}_{-2,0}$).
3	98,0	20 a 30	98,0 MHz	T101, T102	Fije la salida de la patilla 1 del conjunto del sintonizador al máximo nivel. (Antes de efectuar ajuste del paso 3, gire VR401 completamente en contra del sentido de las manecillas del reloj).
4	98,0	60	98,0 MHz	L202	Fije la patilla 2 del conjunto del sintonizador a $1,4V \pm 0,01V$.
5	98,0	80	98,0 MHz	VR401	Fije la patilla 1 del conjunto del sintonizador a $1,1V (\pm 0,01V)$.
		0		—	Inspeccione la patilla 1 del conjunto del sintonizador que esta abajo de 0,8V.
6	98,0	80	98,0 MHz	VR301	Ajuste la frecuencia en la patilla 4 del conjunto del sintonizador a 76kHz ($\pm 150Hz$).
	Sin modulación				
7	98,0	60	98,0 MHz	T102	Reduzca la distorsión tanto en la salida del canal izquierdo como en la del derecho (ajuste T102 a dentro de $\pm 90^\circ$).
	Modulación estero (Nota)				
8	98,0	Variable	98,0 MHz		Confirme que se enciendan el IND STEREO y el IND TUNED cuando el nivel de FM SG es girado a alto, y que los anteriores IND STEREO y IND TUNED se apaguen cuando el nivel de FM SG es girado a bajo.
	Modulación estero (Nota)				

Ajuste de la sección del sintonizador de AM (MW)

- Conecte como es indicado en la Fig. 11-2.
- Oprima la tecla AM (MW) para fijar el modo AM (MW).
- Fije el interruptor de AM CHANNEL STEP (paso de canal de AM) a la posición de 9 kHz. (Solo TX-960/KU)

No. de paso	AM SG (400 Hz, 30% modulación)		Visualización de frecuencia sintonizada TX-960 (TX-960L)	Ajuste	
	Frecuencia (kHz)	Nivel (dB)		Lugar de ajuste	Especificaciones
1	No hay señal de entrada		531 kHz	L401	Fije la patilla 3 del conjunto del sintonizador a $1,3V (\pm 0,1V)$.
2			1602 kHz	TC402	Fije la patilla 3 del conjunto del sintonizador a $10,0V (\pm 0,3V)$.
3	Repita los pasos 1 y 2 hasta que ambos valores nominales especificados sean satisfechos.				
4	603	40	603 kHz	T401	Fije la salida de la patilla 1 del conjunto del sintonizador al máximo nivel.
5	1395	40	1395 kHz	TC401	
6	Repita los pasos 4 y 5 hasta que ambos valores nominales especificados sean satisfechos.				
7	1395	Variable	1395 kHz		Inspeccione que el indicador de TUNING (sintonización) se encienda cuando se aumenta gradualmente el nivel de AM SG.

Ajuste de la sección del sintonizador de AM (LW). (Solo TX-960L)

- Conecte como es indicado en la Fig. 11-2.
- Oprima la tecla AM (LW) para fijar el modo AM (LW).

No. de paso	AM SG (400 Hz, 30% modulación)		Visualización de frecuencia sintonizada TX-960L	Ajuste	
	Frecuencia (kHz)	Nivel (dB)		Lugar de ajuste	Especificaciones
1	No hay señal de entrada		281 kHz	L503	Fije la patilla 3 del conjunto del sintonizador a $5,2V (\pm 0,1V)$.
2	164	40	164 kHz	T501	Fije la salida de la patilla 1 del conjunto del sintonizador al máximo nivel.
3	254	40	254 kHz	TC501	
4	Repita los pasos 2 y 3 hasta que ambos valores nominales especificados sean satisfechos.				

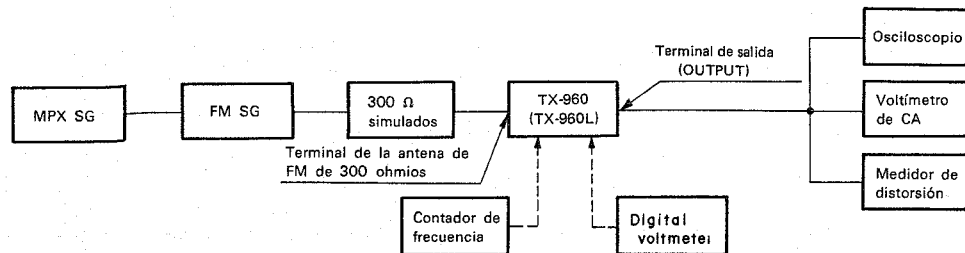


Fig. 11-1 Diagrama de conexión de ajuste de FM

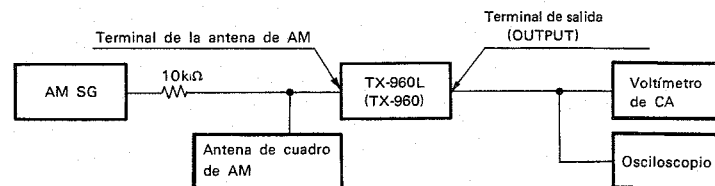


Fig. 11-2 Diagrama de conexión de ajuste de AM

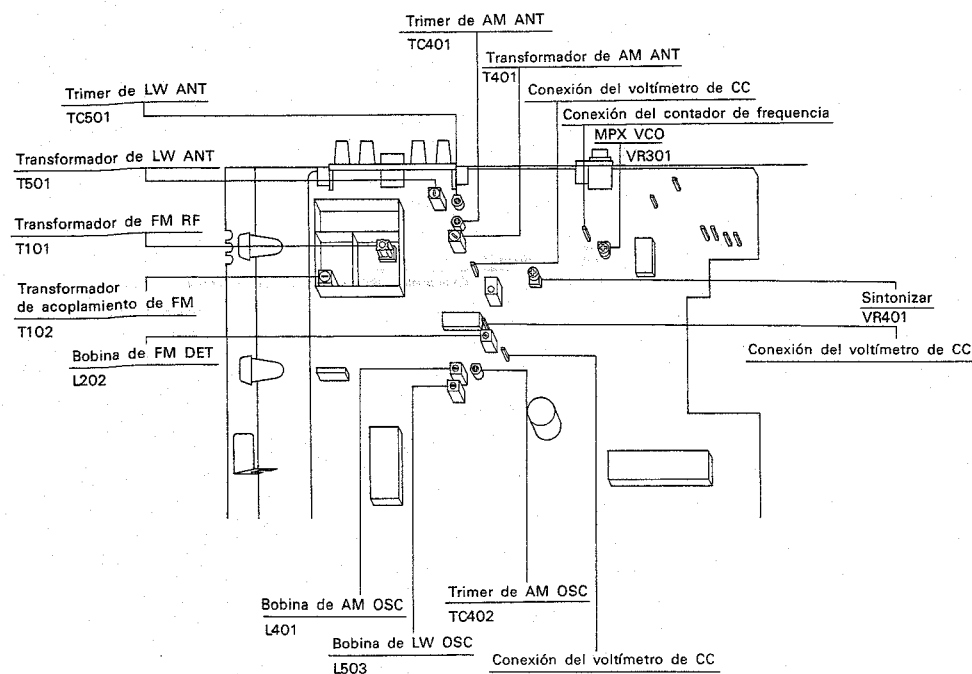


Fig. 11-3 Puntos de ajuste

12. FOR HE AND HB TYPES

Contrast of Miscellaneous Parts

The TX-960L(BK)/HE, HB and TX-960L/HE, HB are the same as the TX-960(BK)/KU with the exception of the following sections

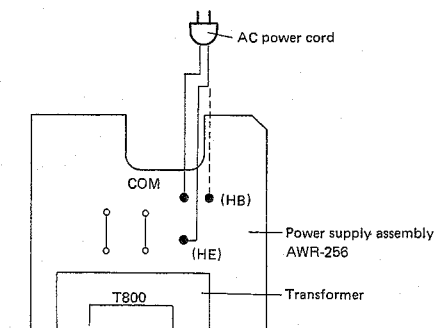
Mark	Symbol & Description	Part No.				
		TX-960(BK)/ KU	TX-960L(BK)/ HE	TS-960L(BK)/ HB	TX-960L/ HE	TX-960L/ HB
▲ ★ ★	Tuner assembly	GWE-243	GWE-241	GWE-241	GWE-241	GWE-241
	Power supply assembly	AWR-257	AWR-256	AWR-256	AWR-256	AWR-256
	Fuse (FU801: 0.8A/125V)	AEK-118
	Fuse (FU801: T400mA/250V)	...	AEK-407	AEK-504	AEK-407	AEK-504
	Bonnet	ANE-548	ANE-548	ANE-548	ANE-557	ANE-557
▲	Front panel	ANY-028	ANM-950	ANM-950	ANM-955	ANM-955
	Display cover	ANZ-112	ANZ-053	ANZ-053	ANZ-067	ANZ-067
	Operating instructions (English)	ARB-684	...	ARB-684	...	ARB-684
	Operating instructions (English/German/French/Italian)	...	ARE-151	...	ARE-151	...
	Packing case	AHE-597	AHE-522	AHE-522	AHE-532	AHE-532
▲	AC power cord	ADG-073	ADG-071	ADG-078	ADG-071	ADG-078

Line Voltage Selection

Line voltage can be changed with following steps.

1. Disconnect the AC power cord.
2. Remove the top cover.
3. Change the connection of the power supply assembly (AWR-256) primary pins.
4. Stick the line voltage label on the rear panel.

Part No.	Description
AAX-193	220V label
AAX-192	240V label



ELECTRICAL PARTS LIST

NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).

560Ω 56 × 10¹ 561.....RD4PS 561 J
 47kΩ 47 × 10³ 473.....RD4PS 473 J
 0.5Ω 0R5RN2H 0R5 K
 1Ω 010RS1P 010 K

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ 562 × 10¹ 5621.....RN4SR 5621 F

- The Δ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

- For your Parts Stock Control, the fast moving items are indicated with the marks **★** and **★**.

★ ★ GENERALLY MOVES FASTER THAN ★

This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

Miscellaneous

Mark	Symbol & Description	Part No.	Mark	Symbol & Description	Part No.
	Complex assembly				
	Tuner assembly	GWE-241	★ ★	S3~S11, S14~S16 Tact switch	ASG-711 (ASG-703)
	Switch assembly	Non supply			
	LED assembly	Non supply			
	Switch assembly	Non supply			

SWITCHES

Δ	Power supply assembly	AWR-256
Δ ★ ★	Fuse (FU801: T400mA/250V)	AEK-407 (HE type) AEK-504 (HB type) ADG-071 (HE type) ADG-078 (HB type)
Δ	AC power cord	

Tuner Assembly (GWE-241)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★ ★	IC301	AN7470
★ ★	IC401	LA1260
★ ★	IC702	TC9157AP
★ ★	IC701	TD6104P
★ ★	IC703	TD6301AP
★ ★	Q304, Q407, Q408, Q501, Q605, Q607	2SA933S
★ ★	Q301~Q303, Q401~Q404, Q502, Q606, Q608, Q701~Q707	2SC1740S
★ ★	Q103, Q201	2SC2668
★ ★	Q102	2SC2786-L
★ ★	Q104, Q105, Q406	2SK161-Y (2SK241-Y)
★ ★	Q101	2SK241-Y
★	D405, D605	RD5.6EB (HZ5.6EB)
★	D401, D402, D505	SVC321C3/D3
★	D503, D504, D506, D508	1SS85
★	D101~D103	1SV147
★	D301, D404, D406~D410, D501, D502, D507, D509, D702~D704, D707~D709	1S1555 (US1035) (1SS131)

COILS, TRANSFORMERS AND FILTERS

Mark	Symbol & Description	Part No.
	L401 AM OSC coil	ATB-100
	L101 FM ANT coil	ATC-192
	L102 FM ANT coil	ATC-193
	L103 FM OSC coil	ATC-214
	L503 LW OSC coil	ATD-023
	L202 FM DET coil	ATE-072
	L501, L502 Inductor	ATH-108
	L203 Inductor	ATH-116
	L104, L105 L201 Inductor	ATH-049
	T401 AM ANT transformer	ATB-099
	T101 FM RF transformer	ATC-194
	T501 LW ANT transformer	ATD-027
	T102 FM coupling transformer	ATE-063
	F202 FM ceramic filter	ATF-107
	F201 FM ceramic filter	ATF-119
	F301 Beat eliminate filter	ATF-146
	F401 AM ceramic filter	ATF-133

CAPACITORS

Mark	Symbol & Description	Part No.
	C713 (3300μF/10V)	ACH-389
	TC401, TC402 Trimmer	ACM-015
	TC501 Trimmer	ACM-020
	C716	CCCH180J50 (CCDCH180J50)
	C509	CCCH680J50 (CCDCH680J50)
	C416, C718	CCCSL221J50 (CCDSL221J50)
	C117, C401	CCDCH080D50
	C115, C404, C505, C717	CCDCH150J50
	C116	CCDCH330J50
	C101, C102, C105, C106	CCDRH390J50
	C108	CCDSL020C50
	C109, C111, C112	CCDSL050C50
	C110, C426	CCDSL101J50
	C119	CCDTH180J50
	C422	CEANP4R7M35
	C308, C427	CEAR22M50L
	C406, C425, C702, C709, C711, C712	CEA010M50L
	C306, C705	CEAIR5M50L
	C418, C723	CEA100M16L
	C312, C313, C423	CEA2R2M50L
	C303, C604	CEA221M16L
	C301, C302, C307, C701	CEA3R3M50L
	C605~C607, C703	CEA330M16L
	C311, C414, C501, C503	CEA470M25L
	C720	CEA471M16L
	C714	CEA471M6L
	C309, C310, C410, C411	CKCYB102K50 (CKDYB102K50)
	C314, C315	CKCYB332K50 (CKDYB332K50)
	C316	CKCYB681K50 (CKDYB681K50)
	C305, C412, C413, C419, C502, C710	CKCYF473Z50 (CKDYF473Z50)
	C415	CKCYX473M25 (CKDYX473M25)
	C104, C107, C113, C114, C118, C201, C403, C420, C704, C706~C708, C721, C722, C724	CKDYF103Z50
	C103, C214, C402, C407, C408, C504, C506, C715, C719	CKDYF223Z50
	C421	CQMA104J50
	C507	CQSA301J50
	C405	CQSA431J50
	C304	CQSA471J50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
★	VR401 Semi-fixed (220KΩ)	VRTB6VS224
★	VR301 Semi-fixed (4.7KΩ)	VRTB6VS472
Δ	R601	RSILMF151J
	R720, R721 Resistor array	RA12S473J
	R404, R405, R421, R432	RD14PMD00J
	Other resistors	RD18PMD00J

OTHERS

Mark	Symbol & Description	Part No.
	Terminal (ANTENNA with connector socket)	AKA-018
	Terminal (OUTPUT)	AKB-093
★	V1 Fluorescent tube	AAV-028
★	X701 Crystal resonator	ASS-025

Switch Assembly

SWITCHES

Mark	Symbol & Description	Part No.
★ ★	S12, S13 Tact switch	ASG-711 (ASG-703)

LED Assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★	D901	AEL-382
★	D902	AEL-424

Switch Assembly (POWER)

SWITCH

Mark	Symbol & Description	Part No.
★ ★	S100 Push switch (POWER)	ASG-413

Power Supply Assembly (AWR-256)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
Δ ★ ★	IC800	μ PC78M12H
Δ ★	D800 ~ D803	S5566 (11E2)

TRANSFORMER

Mark	Symbol & Description	Part No.
Δ ★	T800 Power transformer (220V/240V)	ATS-096

CAPACITORS

Mark	Symbol & Description	Part No.
	C800	CEAS222M35
	C802	CEA221M16L
	C801	CKDYF473Z50
	C804	CKDYF103Z50

OTHER

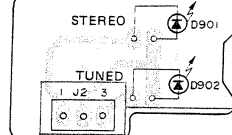
Mark	Symbol & Description	Part No.
	Screw	PBZ30P060FMC

P.C. BOARDS PATTERNS

• For TX-960L(BK)/HE, HB and TX-960L/HE, HB models.

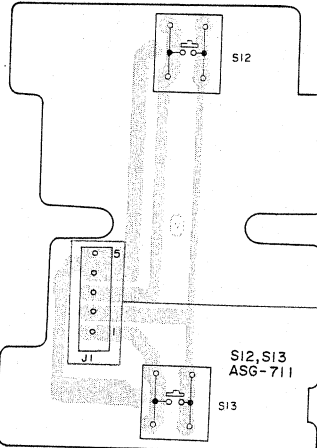
TUNER ASSEMBLY (GWE-241)

LED ASSEMBLY



D901 AEL-382
D902 AEL-424

SWITCH ASSEMBLY

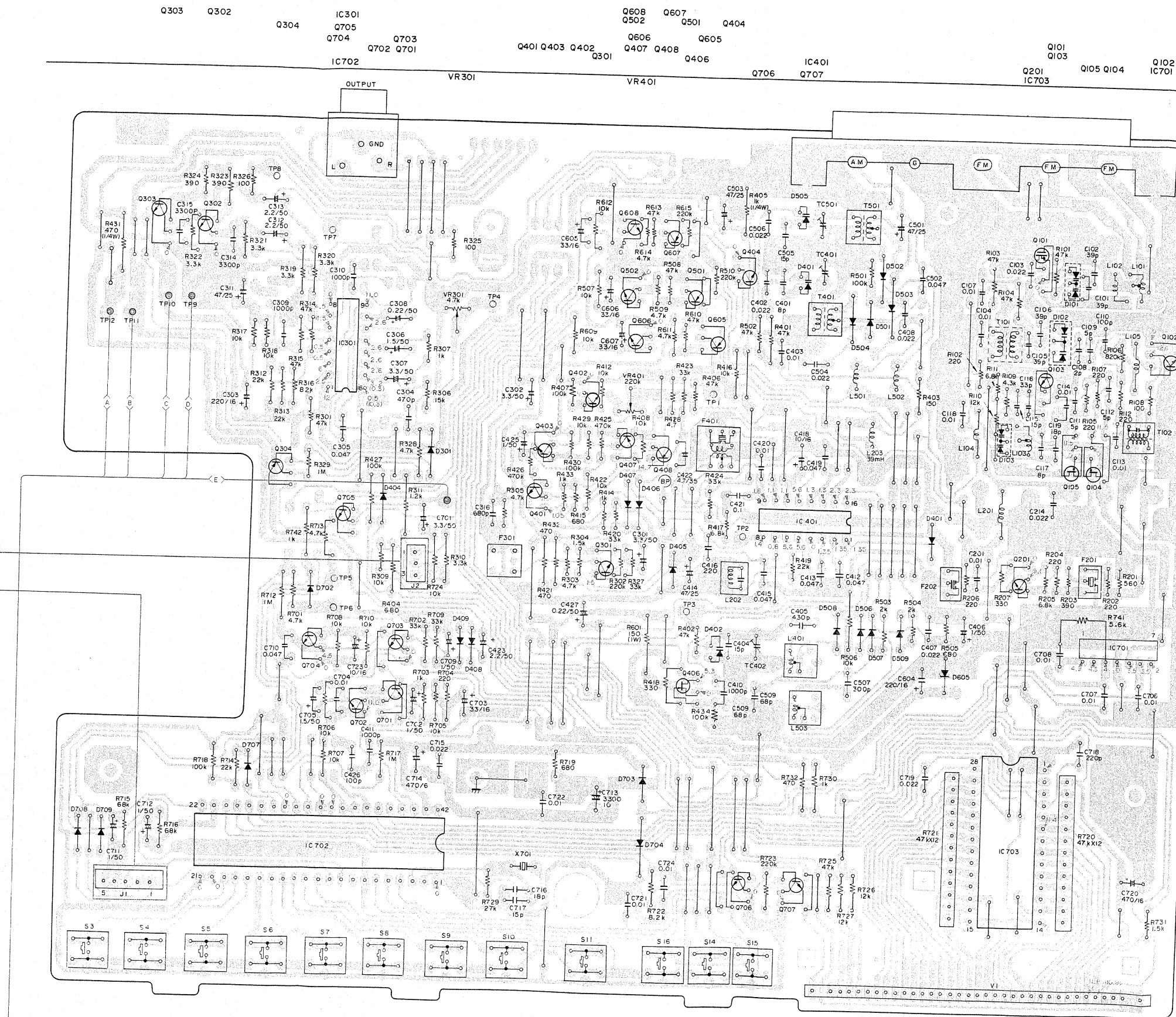


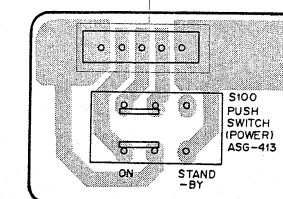
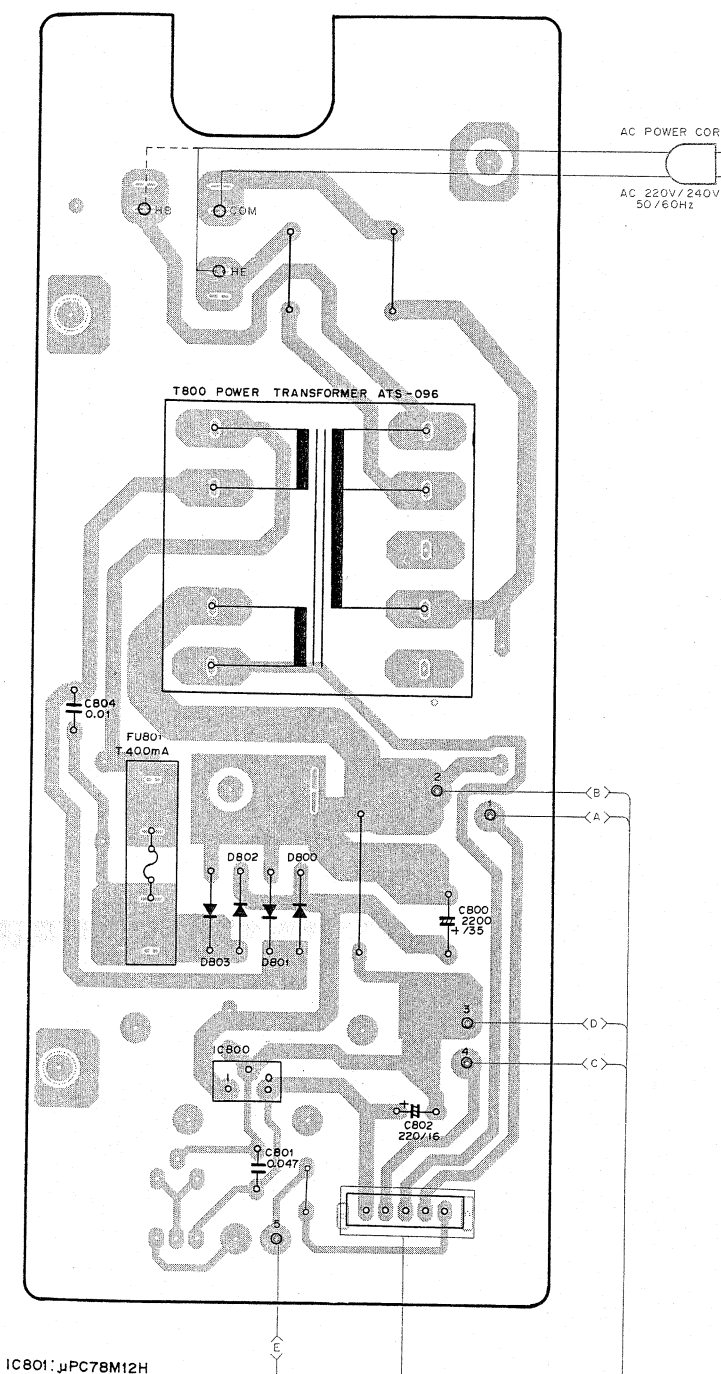
IC 301: AN 7470
IC 401: LA 1260
IC 701: TD6104P
IC 702: TC 9157AP
IC 703: TD 6301AP

D101, 102, 103: ISV 147
D 301, 404, 406-410: 501, 502, 507, 509
702-704, 707-709: IS1555 (US1035) (ISS131)
D405, 605: RD5.6EB (HZ 5.6EB)
D401, 402, 505: SVC321C3/D3
D503, 504, 506, 508: ISS85

Q101: 2SK241-Y
Q102: 2SC2786-L

Q103, 201: 2SC2668
Q104, 105, 406: 2SK161-Y (2SK241-Y)
Q 301, 302, 303, 502: 401-404, 606, 608
701-707: 2SC1740S
Q 304, 407, 408, 501: 605, 607: 2SA933S





SWITCH ASSEMBLY

